Database Principles Coursework: Group 08

Group Contribution Statement

	up2178845	up2199179	up2294223
Assumptions	☑	☑	☐
ERD Design	☑	☑	☑
Data Dictionary	☑	☑	☑
Database Creation	☑	☑	☑
Queries	☑	☑	☑
Theoretical Aspects	☑	☑	☐
Document writing	☑	☑	☑
Security Features	☑	☐	☑
Database Optimisation	☑	☑	☐
Percentage Allocation	**33.33%**	**33.33%**	**33.33%**
Signature			

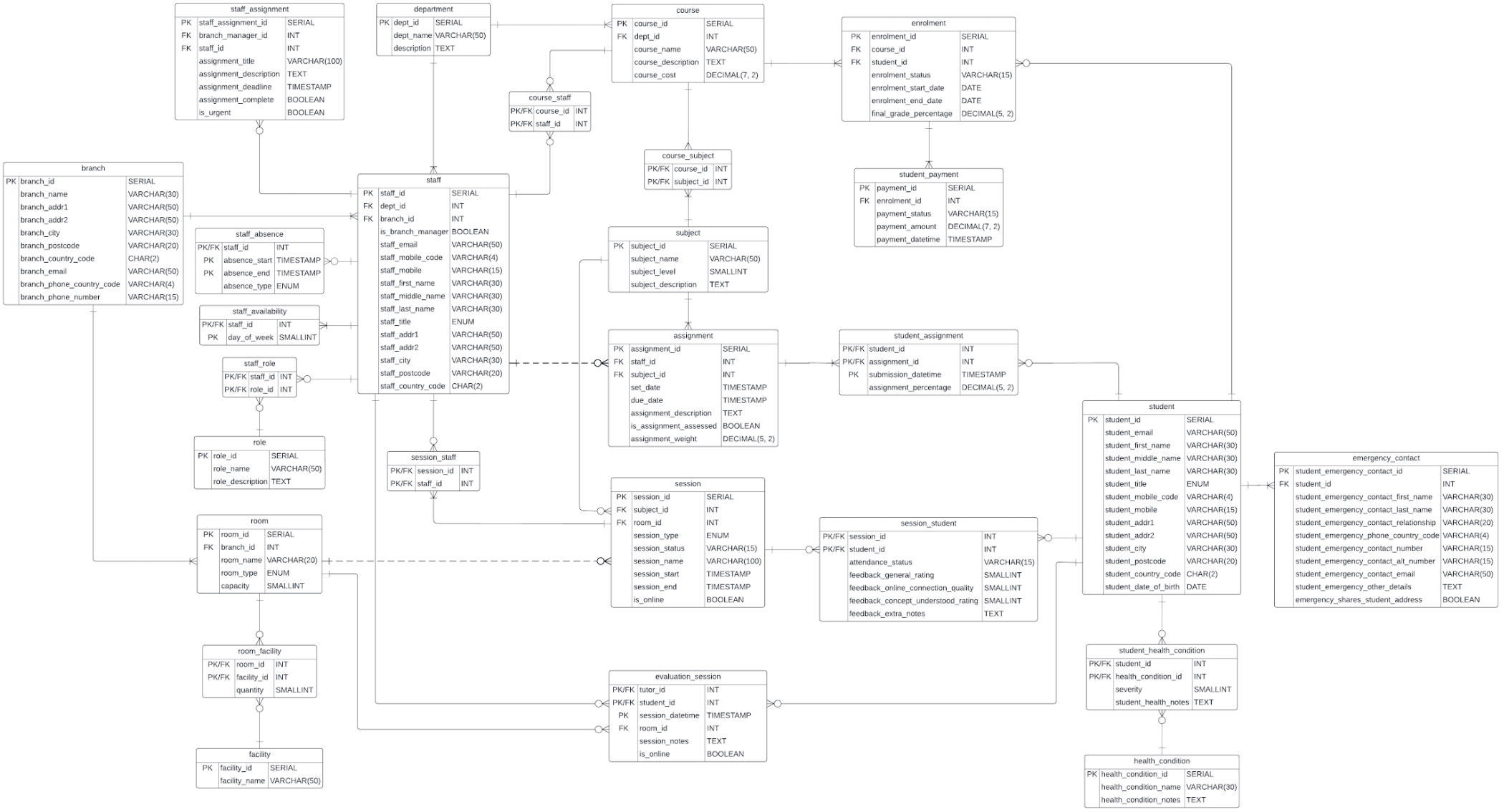
Database Development Tracker

Date	Meeting Description	Members Present	Task Details	Time	Signatures
11th Oct 2024	Requirements Analysis	☑ up2178845 ☑ up2199179 ☑ up2294223	We each went through the case study and made notes on what the business needs. We also set up a GitHub repository for the SQL file.	1.5h	
16th Oct 2024	ERD Collation/ Creation	☑ up2178845 ☑ up2199179 ☑ up2294223	We combined old ERDs, and created a roughly improved ERD for the new system.	1h	
23rd Oct 2024	New Tables for ERD	☑ up2178845 ☑ up2199179 ☑ up2294223	Created tables and modified attributes from the newly created ERD, creating new assumptions, resolving problems.	1h	
6th Nov 2024	ERD Finalisation + SQL CREATEs Started	☑ up2178845 ☑ up2199179 ☑ up2294223	Finalised any changes to ERD, now no longer needs changes. Got started on the coding of the database with the CREATE statements.	1h	
14th Nov 2024	Data Dictionary Creation	☑ up2178845 ☑ up2199179 ☑ up2294223	After finishing database creation, we created the data dictionary.	2h	
20th Nov 2024	SQL INSERTs Generated	☑ up2178845 ☑ up2199179 ☑ up2294223	Standard INSERT statements were created for our database, ensuring full functionality.	2h	
4th Dec 2024	SQL 5 Important Queries Created	☑ up2178845 ☑ up2199179 ☑ up2294223	Based on the above INSERTs, 5 important business queries were created and tested.	3h	

12th Dec 2024	Database Security and Transaction Analysis	☑ up2178845 ☑ up2199179 ☑ up2294223	We implemented measures to maintain database security, and performed transaction analysis on our queries, to suggest optimisation techniques.	2h	
13th Dec 2024	Document Writing	☑ up2178845 ☑ up2199179 ☑ up2294223	Compiling all notes made from ERDs and discussions, we finalised the creation of the document ready for submission.	4h	

Entity Relationship Diagram

The below ERD is formed as a combination of pre-existing databases for the business, which had a few simple aspects, which were expanded upon to suit the current business' needs.



Design Assumptions

When designing our new ERD, we made a few design assumptions as these could/would be accounted for outside of the database-level, such as website registering or following a guide when creating assignments, etc.

A staff member is anyone that works for the branch, meaning any member of staff could be anything such as a janitor, career advisor, or the branch manager themselves. There is no limit to the amount of roles a member of staff can have at the same time. When staff are creating assignments and setting the weighting of the assignments, it is assumed that the sum of these within a subject cannot be more than 100%, and as there is no trigger for checking this, it is assumed to be accounted for at the business level between employees. For students, they can make payments for enrolments in instalments of their choosing, rather than one lump sum. Also, any student can enrol in multiple courses at any one time which is not the same as completing one course and then going to study another. While unlikely, it may still happen. For specific courses and modules, the “subject” entity refers to a module for a course; all instances of subject refer to a module. Some subjects can also be taught across different courses. All teaching sessions are of the form(s): 1-1 teaching session, multi-student lecture and labs/workshops, all of which can occur in person or online. A facility in a room refers to anything used for educational purposes such as a computer, science equipment or microscope/small whiteboard.

Assuming that the business wants to expand into the future, a few considerations were made:

- The length of the post code was extended to a varying character of 20, as the longest postcode length in a country is 20 characters long.
- Mobile numbers have a country code which follows the format of a +, followed by 1-3 numbers. There is no validity check however, so it is assumed the user selects from a predetermined list when registering their details.
- A 2-character country code was added, as this can easily convey the country a specific branch/student/staff member is located.

Security Considerations

The two main features that we considered in terms of security are access permissions and attribute encryption.

Access Permissions

In terms of access permissions in the database, we decided to create some roles in the database. One of the main roles is a coordinator, who manages all the staff members alongside which courses and modules are offered by the business. This role has viewing access to all data, however some tables have extra permissions, such as the ability to add/modify/delete data from tables such as staff, courses, roles, subjects, which courses have which subjects, branch/room information, as well as adding new health conditions should studies find evidence that some conditions affect learning or if a student has a condition that is not yet logged. This role is the role with the most privileges. The reasoning for adding this role specifically is because we assume that there must be some kind of higher up person(s) who can modify what the business offers to students and staff respectively. This role would also be able to create other roles for potential staff members and branch managers, or assign roles to pre-existing staff members.

Another role we created was the teacher role, which is able to view data for every session, alongside viewing some of the students' details, enrolment information, all assignments and assignment submissions. This general role helps all staff have a good understanding of how teaching is going. While they are able to view information about courses they are not necessarily a part of, this would not be classed as a breach of information.

We have considered other roles, but did not implement them as the technical knowledge of our team would not be able to fulfil this to a good standard. These roles are:

- Individual staff member roles:
    - This would be applied to every existing row in the staff table, and these roles would be able to view their details alongside viewing their assignments, as well as create absences in the tables which are joined to their details. They would also be able to view their assignments, but not edit or delete it. This is different to the teacher role as this applies to every single staff member, of which some may not be teachers.
- Individual student roles:
    - Like above, this would be applied at the row level, meaning each student would be able to view their own information, and be able to update some of it, such as their address, health conditions and emergency contact information, or pay some instalments for enrolments.
- A branch manager role
    - The main reasoning for not being able to include this is that it inherits all permissions from the staff_member role, alongside extra permissions. Such extra permissions would include being able to assign tasks to staff, oversee scheduling and session creation, as well

as having update/create permissions within all branch features, such as branch details, room and facility information, and which staff members are part of which branch.

If we had been able to add the row-level staff_member role, then we would be able to include inheritance to the teacher role we did create. Within the SQL file is the code adding the two mentioned roles to the database.

Encryption

Within the database, there is little information that would be considered sensitive to a member of the public. Information such as email addresses, residential addresses and phone numbers of students and staff; emergency contact information and health conditions could be considered sensitive and could cause risks to the users if accessed by unauthorised persons. Because of that, we considered encrypting them. However, after research, we discovered that this Information is categorised as personally identifiable information (PII) and is strictly regulated by laws such as the General Data Protection Regulation (GDPR) in Europe and similar laws worldwide.

Although these regulations mandate that organizations take appropriate measures to secure information and protect it from unauthorised access and misuse, deciding to encrypt every piece of PII would not be a practical and cost-effective decision because encryption comes with significant performance costs and can increase the database's size, especially when the data is frequently accessed by the application. So instead, other protective measures such as access control have been put in place and unless encryption is mandated by a country's government, it won’t be in use.

Situations where data would be encrypted or hashed in the future would be when we’re collecting very sensitive information such as:

- User credentials eg. password for account after registration.
- Financial data eg. credit card information.

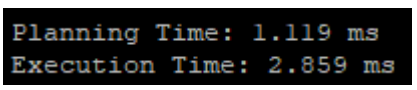
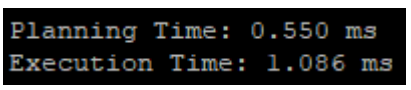
Database Optimisation

We applied a transaction matrix on some important transactions to the database.

	TRANSACTION MATRIX																			
	DEPARTMENT				BRANCH				STAFF				STAFF_AVAILABILITY				STUDENT				ASSIGNMENT				STUDENT_ASSIGNMENT			
TRANSACTION	C	R	U	D	C	R	U	D	C	R	U	D	C	R	U	D	C	R	U	D	C	R	U	D	C	R	U	D
ADD STAFF		X				X			X				X															
ACCESS STAFF INFO		X				X				X				X														
VIEW STUDENT GRADES																		X				X				X		

It is important to use a transaction matrix to help direct the optimisation process of a database. This is because they can be used to identify which tables are accessed the most for common transactions as well as what CRUD operations are taking place. In the case of our database, we can see that the staff table will be accessed frequently by transactions due to the size of the table and the amount of relations it has with other tables. Furthermore, the staff table is absolutely critical to the business rules as it is a core component of any school. Because of this, we should optimise the usage of the table by using a variety of methods such as VIEWS and indexing. We could have also analysed the peak load of the database; where the usage of the database is at its highest at different times of the day / week. An example of where we have optimised the usage of the staff table is by using a view for the query that displays the top 5 most and least understood sessions (as it lists the staff involved with each session).

For the query showing the highest and lowest feedbacked sessions, we created one version utilising a VIEW, and another using a subquery. Below are the comparisons of planning and execution time of both:

	QUERY TYPE	
	VIEW	**Subquery (WITH [name] AS)**
Planning Time (ms)	1.119	0.550
Execution Time (ms)	2.859	1.086
Total Time (ms)	3.978	1.636
Screenshot		

The table above shows using a subquery makes the total execution time almost twice as fast, which makes sense, as selecting all attributes from a pre-existing view could take time as it would have to query the same view twice within the UNION statement. Whereas within a sub-query, the results of the query are already stored and only need to be queried once.

Professional, Ethical and Legal Issues

Throughout the design of this database, there were some issues that needed addressing. Most of these issues revolve around sensitive information to the business and how it is handled. To start, a potential ethical issue of the database system is the storing of student's personal health information. While this is made completely optional as illustrated in our entity relationship diagram, it is shown that mental health conditions and physical health conditions both contribute towards the learning and development of students (Blackorby & Cameto, 2004). As a result, we believe storing this information will benefit the business and the students, as it helps understand any issues with academic performance, and gives the option for the student to receive any necessary adjustments to their learning as a result.

Another large problem is the legal issue of handling and managing course payments. SES provides a service for students, and functions as a legal business. As a result, if students do not pay the proper amount for a course over a certain period of time, legal action would have to be taken. As was stated in our assumptions, the students are able to pay in instalments, and there should be systems in place to prevent students from abusing this.

Queries

Query 1 - staff_details

Staff Name	Email	Branch	Roles	No. Overdue Assignments	No. sessions taught
Chadd Charnley	jcharnleylc@ses.edu	Glasgow Learning	Administrator, IT Support, Security Guard, Receptionist, Finance Manager, ...	4	0
Chester Nevison	tnevisonx@ses.edu	Leeds Office	Administrator, Security Guard, Finance Manager, HR Manager	4	1
Jim Fernez	ffernezk@ses.edu	Glasgow Learning	Administrator, Cleaner	4	2
Moyra Kilroy	bkilroya@ses.edu	Oxford Branch	Administrator, IT Support, Tutor, Security Guard, Receptionist	4	2
Roscoe Griff Gillise	ggillisela@ses.edu	Cardiff Academy	Administrator, IT Support, Cleaner, Security Guard, Lab Technician, ...	4	1
Tommi Ockwell	sockwell8@ses.edu	Oxford Branch	Cleaner, Finance Manager, HR Manager, Academic Advisor, Counselor, ...	4	2
Damita Carlozzi	dcarlozzil4@ses.edu	Birmingham South	Administrator, Tutor, HR Manager	3	0
Dollie Durant	ndurantl@ses.edu	Edinburgh Campus	IT Support, Tutor, Cleaner, Finance Manager, HR Manager, ...	3	21
Fairlie Grizard	tgrizardb@ses.edu	Leeds Office	Administrator, Receptionist, HR Manager	3	1
Hi Bamblett	kbamblettw@ses.edu	Edinburgh Campus	Administrator, Cleaner, Security Guard, Lab Technician, HR Manager	3	0
Rozanna Pawling	dpawlingy@ses.edu	Liverpool Institute	Administrator, Cleaner, Lab Technician, HR Manager	3	1
Carr Gethouse	vgethousel6@ses.edu	Birmingham South	Administrator, IT Support, Cleaner, Receptionist	2	1
Clarissa Morfey	wmorfey2@ses.edu	Liverpool Institute	Cleaner, Security Guard, Receptionist, Academic Advisor, Counselor, ...	2	16
Dara Lambdin	jlambdino@ses.edu	Central London	Administrator, Security Guard, Receptionist, Finance Manager	2	0
Devinne Moxsom	mmoxsom6@ses.edu	Manchester Hub	Tutor, Academic Advisor, Library Manager, Workshop Facilitator, Event Organizer	2	2
Irena MacRanald	amacranalds@ses.edu	Cardiff Academy	Administrator, IT Support, Cleaner, Finance Manager	2	1
Julianna Keough	ckeough18@ses.edu	Birmingham South	Administrator, IT Support, Cleaner, Security Guard, Receptionist, ...	2	1
Justinn Benz	sbenzc@ses.edu	Glasgow Learning	Administrator, IT Support, Tutor, Security Guard, Receptionist, ...	2	0
Kellsie Rickasse	vrickasseq@ses.edu	Birmingham South	Administrator, IT Support, Receptionist, Finance Manager	2	1
Mendel Penhearow	jpenhearowm@ses.edu	Glasgow Learning	Administrator, Cleaner, Receptionist, HR Manager	2	2
Tina Abbott	mabbottj@ses.edu	Oxford Branch	Administrator, IT Support, Tutor, Cleaner, Receptionist, ...	2	1
Wilt Bento	jbentolb@ses.edu	Manchester Hub	Administrator, IT Support, Tutor, Cleaner, Security Guard, ...	2	0
Wye Rutt	cruttg@ses.edu	Cardiff Academy	Administrator, IT Support, Tutor, Security Guard, Receptionist	2	0
Adelheid Giovannazzi	agiovannazzip@ses.edu	Liverpool Institute	Administrator, IT Support, Finance Manager	1	0
Antonius Ivermee	sivermee0@ses.edu	Manchester Hub	Cleaner, Lab Technician, Finance Manager, Academic Advisor, Marketing Manager, ...	1	21
Bridgette Chewter	achewterz@ses.edu	Oxford Branch	Administrator, IT Support, Security Guard, Finance Manager, HR Manager	1	2
Bryce Amberson	bamberson5@ses.edu	Manchester Hub	Tutor, Security Guard, Receptionist, HR Manager, Course Coordinator, ...	1	3
Camel Bennedsen	mbennedsen4@ses.edu	Cardiff Academy	IT Support, Tutor, Receptionist, Lab Technician, HR Manager, ...	1	4
Chelsie Connah	kconnah7@ses.edu	Bristol Centre	Lab Technician, HR Manager, Marketing Manager, Data Analyst	1	5
Clemmy Garrett	dgarrettl9@ses.edu	Liverpool Institute	Administrator, IT Support, Tutor, Security Guard, Receptionist, ...	1	1
Farra Toolan	ltoolan17@ses.edu	Cardiff Academy	Administrator, IT Support, Security Guard, Receptionist, HR Manager	1	0
Fenelia Gittus	cgittusld@ses.edu	Glasgow Learning	Administrator, Lab Technician	1	1
Genevra Stanistrete	jstanistretee@ses.edu	Liverpool Institute	Administrator, IT Support, Tutor, Security Guard	1	0
Hal Strute	tstruter@ses.edu	Bristol Centre	Administrator, IT Support, Cleaner, Security Guard, Finance Manager, ...	1	0
Kalie Willshire	dwillshirev@ses.edu	Oxford Branch	Administrator, IT Support, Cleaner, Lab Technician, HR Manager	1	1
Marj Skamal	iskamall5@ses.edu	Cardiff Academy	Administrator, Tutor, Security Guard	1	1
Nell Caller	gcallerd@ses.edu	Oxford Branch	Administrator, IT Support, Lab Technician, HR Manager	1	1
Shermy Chretien	schretiennm@ses.edu	Liverpool Institute	Administrator, IT Support	1	1
Sunny Calida Nanuccioi	cnanuccioiu@ses.edu	Birmingham South	Administrator, Cleaner, Security Guard, Lab Technician, Finance Manager, ...	1	0
Sylvia Stubley	cstubleyl3@ses.edu	Leeds Office	Administrator, Cleaner, Lab Technician, Finance Manager, HR Manager	1	0
Verna Silvano Wallenger	swallengerf@ses.edu	Cardiff Academy	Administrator, IT Support, Receptionist, Finance Manager	1	0
Wallis Shervington	mshervingtonl0@ses.edu	Glasgow Learning	Administrator, IT Support, Cleaner, Lab Technician	1	0
Zaneta McBryde	smcbrydel@ses.edu	Central London	Administrator, IT Support, Tutor, Lab Technician, HR Manager	1	0
Cherin Foxhall	yfoxhallh@ses.edu	Manchester Hub	Administrator, IT Support, Cleaner, HR Manager	0	2
Jasmina Garwood Gaenor	ggaenort@ses.edu	Birmingham South	Administrator, IT Support, Tutor, Lab Technician, Finance Manager	0	1
Jessi Letchmore	kletchmorel2@ses.edu	Cardiff Academy	Administrator, IT Support, Tutor, Cleaner, Security Guard, ...	0	2
Nigel Friberg	cfriberg3@ses.edu	Oxford Branch	Cleaner, Security Guard, Receptionist, Lab Technician, HR Manager, ...	0	19
Penni Cess	ccess9@ses.edu	Birmingham South	Administrator, Tutor, Cleaner, Security Guard, Receptionist, ...	0	0
Sela Chritchley	cchritchleyi@ses.edu	Glasgow Learning	Administrator, Security Guard, Finance Manager	0	1
Sylas Shelley Hiscoe	shiscoell@ses.edu	Manchester Hub	Administrator, IT Support, Tutor, Lab Technician, HR Manager	0	1

(50 rows)

This query displays every staff member's details, including their name, email and branch name. It also shows some of the roles the staff member has, limited to 5 and being replaced with "..." if the staff member has more. The query also shows the number of overdue assignments the staff member has, sorted in descending order, which then sorts by the staff's first name alphabetically. Finally, it displays the number of sessions the staff member has taught as another evaluation metric for staff members.

This is useful for the business as it gives a simple but easily representable view of every staff member and what metrics are used to analyse their performance. For example, if a staff member has a lot of overdue tasks with a lot of sessions taught, then the business could try and account for this as they likely teach a lot.

Query 2 - no_recent_eval_session_students

Student with No Session Within 6 Months	Most Recent Session
Luca R. Miller	0 Evaluation Sessions on Record
Grace Harris	0 Evaluation Sessions on Record
Harper Johnson	0 Evaluation Sessions on Record
Charlotte Bell	0 Evaluation Sessions on Record
Ava Walker	2021-03-03 16:50:00
Harry K. Martin	2021-11-02 09:10:00
Noah G. Lewis	2022-05-06 08:00:00
Jacob L. Baker	2022-06-24 17:00:00
Lucy Green	2022-08-05 12:10:00
Eliza V. Cameron	2022-09-27 09:00:00
Ella James	2022-10-10 11:10:00
Theo T. Robinson	2023-01-31 13:20:00
Scarlett Green	2023-03-26 10:50:00
Mia Harris	2023-04-15 09:10:00
Ethan H. Young	2023-04-19 08:40:00
Benjamin O. Clarke	2023-04-23 10:00:00
Amelia Evans	2023-07-10 15:20:00
Oliver Jackson	2023-07-25 08:40:00
Zachary P. Lee	2023-09-28 15:30:00
Lucas M. Davis	2023-10-18 13:20:00
Ryan Q. Taylor	2023-11-28 12:20:00
Jack J. Scott	2024-01-22 10:30:00
Arabella King	2024-02-12 12:50:00
Olivia Adams	2024-03-20 17:20:00
Sophie White	2024-04-17 16:30:00
William I. King	2024-05-02 17:10:00
Maximus S. Scott	2024-05-03 11:40:00
Isabella Martin	2024-05-30 15:30:00
Grace Bennett	2024-06-05 15:50:00

(29 rows)

Next, this simpler query displays every student who has not had an evaluation session within the last 6 months, including those who have not had one at all. This is displayed alongside the most recent evaluation session date. The query is ordered with the students having no evaluation sessions on top, followed by the date of their most recent evaluation session, sorted oldest to newest. This is useful as it focuses on improving students' progress and making sure all students are receiving the necessary support they can get. By prioritising those who have not had an evaluation session yet, or those who have not had one for the longest time, it puts them on a priority list of sorts, highlighting that they would need a more thorough evaluation session.

Query 3 - student_enrolment_not_fully_paid

Student	Course	Course Cost	Total Successful/Unsuccessful Payments	Amount Left to Pay
Ella James	application	9055.25	100.00 / 0.00	8955.25
Charlie F. Clark	infrastructure	8792.69	0.00 / 0.00	8792.69
Grace Harris	middleware	8737.43	0.00 / 0.00	8737.43
Harper Johnson	middleware	8737.43	0.00 / 0.00	8737.43
Ryan Q. Taylor	middleware	8737.43	0.00 / 0.00	8737.43
Lucia Morris	foreground	8105.81	0.00 / 0.00	8105.81
Harper Johnson	foreground	8105.81	0.00 / 0.00	8105.81
Jack J. Scott	grid-enabled	7819.92	0.00 / 0.00	7819.92
Jacob L. Baker	grid-enabled	7819.92	500.00 / 0.00	7319.92
Luca R. Miller	array	7308.02	0.00 / 0.00	7308.02
Mia Harris	array	7308.02	0.00 / 0.00	7308.02
Charlotte Bell	array	7308.02	0.00 / 0.00	7308.02
Theo T. Robinson	encompassing	5925.59	0.00 / 0.00	5925.59
Oliver Jackson	encompassing	5925.59	0.00 / 0.00	5925.59
Eliza V. Cameron	Lorem ipsum	5842.37	0.00 / 0.00	5842.37
Luca R. Miller	Lorem ipsum	5842.37	0.00 / 400.00	5442.37
Charlotte Bell	Realigned	5364.57	0.00 / 0.00	5364.57
Harper Johnson	application	9055.25	0.00 / 4000.00	5055.25
Isabella Martin	application	9055.25	0.00 / 4000.00	5055.25
Noah G. Lewis	Ergonomic	4972.83	0.00 / 0.00	4972.83
Zachary P. Lee	Realigned	5364.57	0.00 / 400.00	4964.57
Charlotte Bell	Ergonomic	4972.83	0.00 / 200.00	4772.83
Luca R. Miller	portal	7907.27	0.00 / 4000.00	3907.27
Grace Bennett	Robust	2835.99	0.00 / 0.00	2835.99
Noah G. Lewis	grid-enabled	7819.92	5000.00 / 0.00	2819.92
Lucia Morris	infrastructure	8792.69	7000.00 / 0.00	1792.69
Ava Walker	logistical	920.82	0.00 / 0.00	920.82
Olivia Adams	portal	7907.27	7000.00 / 0.00	907.27
Luca R. Miller	transitional	848.60	0.00 / 0.00	848.60
Sophie White	transitional	848.60	0.00 / 0.00	848.60
Eliza V. Cameron	logistical	920.82	100.00 / 0.00	820.82
Maximus S. Scott	logistical	920.82	100.00 / 0.00	820.82
Harry K. Martin	info-mediaries	7676.67	7000.00 / 0.00	676.67
James N. Martinez	info-mediaries	7676.67	7000.00 / 0.00	676.67

(34 rows)

This query above details which students have not fully paid off the cost of their enrolment.

The query shows 5 columns, being the student's name, the course they are studying alongside the cost of the course, and the total amounts in successful and unsuccessful payments, with the final column being the total amount left to pay back for their course. The final column is calculated by subtracting the total of successful payments from the course cost.

This is very useful for the business financially, as it helps serve as a reminder for who might need financial assistance with paying off their course, or who is close to finishing off paying for a course. This could also be used as a reference if a student wishes to enrol onto another course while having not fully paid off their previous enrolment. Such financial data is key in ensuring the businesses sustainability.

Query 4 - all_session_feedback

Session ID	Average General Rating	Average Rating of Concept Understood	Staff in Session	Rank
26	5.7	9.3	Antonius Ivermee, Clarissa Morfey, Dollie Durant, Nigel Friberg	1
22	8.5	9.0	Clarissa Morfey, Dollie Durant	2
38	7.4	8.8	Antonius Ivermee, Clarissa Morfey, Devinne Moxsom, Dollie Durant, Nigel Friberg	3
13	7.0	8.5	Dollie Durant	4
8	7.3	8.0	Chelsie Connah, Dollie Durant, Julianna Keough, Moyra Kilroy, Rozanna Pawling	5
9	9.0	4.4	Jasmina Garwood Gaenor	36
7	6.2	4.2	Mendel Penhearow, Sela Chritchley, Sylas Shelley Hiscoe, Tommi Ockwell	37
24	5.5	4.0	Antonius Ivermee, Clarissa Morfey, Dollie Durant, Nigel Friberg	38
2	6.0	3.3	Dollie Durant	39
18	4.3	3.3	Roscoe Griff Gillise	40

(10 rows)

This query above shows the top and bottom 5 feedbacked teaching sessions, in relation to the average rating of students' understanding of the concept.

The query displays the ID of the session that took place, the average general rating of the session from students, alongside the average rating of how well students understood the concepts taught. It also includes the staff that were involved in the lecture, and the rank, to indicate where the session concept understanding ranking was placed.

This is very useful for the business as it not only utilises the ability for students to give feedback, it directly takes that and applies it to sessions, and coordinators or branch managers can highlight the top or bottom 5, and give necessary action towards the staff that were part of that session, be it a positive or negative review. This helps ensure that staff who teach well get rewarded, and those who do not teach well receive necessary training or further feedback to improve their teaching abilities.

Query 5 - student_final_grades

Student	Subjects Studied and Final Grades	Any Subject Below 40%?
Amelia Evans	Computer Science (6.58%), Economics (46.32%), Mathematics (102.79%), Physics (47.21%)	Yes
Arabella King	Chemistry (9.05%), Computer Science (11.47%), Economics (14.61%), Engineering (19.43%), Mathematics (115.58%), Physics (68.06%)	Yes
Ava Walker	Economics (26.42%), Mathematics (108.72%), Physics (59.64%)	Yes
Benjamin O. Clarke	Chemistry (7.88%), Computer Science (1.54%), Economics (29.00%), Engineering (12.00%), Mathematics (102.88%)	Yes
Charlie F. Clark	Chemistry (9.43%), Computer Science (8.83%), Economics (81.72%), Engineering (16.55%), Mathematics (28.00%), Physics (64.29%)	Yes
Charlotte Bell	Chemistry (9.10%), Computer Science (11.20%), Economics (32.04%), Engineering (23.91%), Mathematics (99.38%), Physics (30.11%)	Yes
Eliza V. Cameron	Chemistry (5.75%), Economics (11.46%), Engineering (27.76%), Mathematics (59.88%), Physics (7.43%)	Yes
Ella James	Chemistry (8.87%), Computer Science (0.31%), Economics (80.18%), Engineering (12.00%), Mathematics (117.82%), Physics (48.37%)	Yes
Ethan H. Young	Chemistry (7.62%), Computer Science (4.48%), Economics (54.64%), Engineering (8.15%), Mathematics (103.13%), Physics (50.25%)	Yes
Grace Bennett	Chemistry (9.79%), Economics (56.28%), Engineering (12.00%), Mathematics (51.28%), Physics (6.48%)	Yes
Grace Harris	Computer Science (4.01%), Mathematics (42.59%), Physics (29.60%)	Yes
Harper Johnson	Chemistry (9.97%), Economics (29.96%), Engineering (27.05%), Mathematics (121.66%), Physics (65.60%)	Yes
Harry K. Martin	Chemistry (4.00%), Economics (45.71%), Engineering (24.06%), Mathematics (111.13%), Physics (29.83%)	Yes
Isabella Martin	Chemistry (8.91%), Economics (13.33%), Engineering (12.00%), Mathematics (36.00%), Physics (0.49%)	Yes
Jack J. Scott	Chemistry (4.00%), Computer Science (11.62%), Economics (56.06%), Engineering (16.24%), Mathematics (37.12%), Physics (3.66%)	Yes
Jacob L. Baker	Computer Science (11.12%), Economics (30.68%), Engineering (20.84%), Mathematics (16.73%), Physics (59.34%)	Yes
James N. Martinez	Chemistry (4.49%), Economics (48.17%), Mathematics (105.23%), Physics (10.11%)	Yes
Luca R. Miller	Chemistry (7.28%), Computer Science (5.30%), Economics (74.99%), Engineering (27.83%), Mathematics (104.40%), Physics (56.80%)	Yes
Lucas M. Davis	Chemistry (6.99%), Computer Science (1.41%), Engineering (22.37%), Mathematics (116.11%), Physics (48.17%)	Yes
Lucia Morris	Chemistry (4.15%), Computer Science (11.29%), Economics (22.65%), Engineering (25.53%), Mathematics (121.15%), Physics (70.99%)	Yes
Lucy Green	Chemistry (8.00%), Computer Science (4.06%), Economics (83.54%), Engineering (22.45%), Mathematics (38.32%), Physics (57.72%)	Yes
Maximus S. Scott	Economics (13.22%), Engineering (12.00%), Mathematics (48.43%), Physics (8.74%)	Yes
Mia Harris	Chemistry (7.69%), Computer Science (5.27%), Economics (61.73%), Mathematics (109.40%), Physics (50.19%)	Yes
Noah G. Lewis	Chemistry (4.13%), Computer Science (4.95%), Economics (7.23%), Engineering (18.11%), Mathematics (72.66%), Physics (31.58%)	Yes
Oliver Jackson	Chemistry (6.36%), Economics (79.98%), Engineering (13.70%), Mathematics (88.15%), Physics (70.05%)	Yes
Olivia Adams	Computer Science (11.80%), Economics (60.21%), Engineering (17.11%), Mathematics (55.63%), Physics (47.08%)	Yes
Ryan Q. Taylor	Chemistry (7.59%), Computer Science (4.22%), Economics (68.73%), Mathematics (114.24%), Physics (55.66%)	Yes
Scarlett Green	Chemistry (6.35%), Computer Science (9.62%), Economics (77.73%), Engineering (29.19%), Mathematics (81.35%), Physics (9.63%)	Yes
Sophie White	Chemistry (5.81%), Computer Science (8.35%), Economics (60.49%), Engineering (5.83%), Mathematics (87.96%), Physics (57.30%)	Yes
Theo T. Robinson	Computer Science (10.33%), Economics (55.74%), Engineering (2.36%), Mathematics (18.37%), Physics (6.22%)	Yes
William I. King	Chemistry (9.90%), Computer Science (11.55%), Economics (52.10%), Engineering (12.00%), Mathematics (68.63%), Physics (49.31%)	Yes
Zachary P. Lee	Chemistry (7.97%), Computer Science (8.61%), Economics (19.66%), Engineering (22.43%), Mathematics (60.73%), Physics (40.81%)	Yes

(32 rows)

Lastly, this query shows every student, alongside the subjects they are studying/have studied. The columns it shows are the students name, the name of the subjects they have studied, with the final course grade percentage in brackets next to each subject, and finally a column, determining whether they have any subject below a 40% threshold (this threshold is assumed to be the fail mark for a subject.)

For the column showing each course and the final grade, this is calculated with the following algorithm:

- For every submission the student makes in an assessment counting towards the subject mark, if it is late, the assessment mark is capped at 40%.
- The maximum mark across multiple submissions is taken, and multiplied by the assessment weighting, and summed up for each weighted assessment in that subject.
- This sum is the final mark for the subject that the student studied.

This is very useful for both the business and students as it shows them which subjects they need to reflect upon or retake, and tells the business how they can allocate their teaching resources to the students who did not do well, and also allocate students on certain subjects.

Complete Data Dictionary

DEPARTMENT						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
dept_id	PK		SERIAL			
dept_name			VARCHAR(50)	UNIQUE; NOT NULL		
description			TEXT	NOT NULL		A summary of the department, what they cover, etc.

COURSE						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
course_id	PK		SERIAL			
dept_id	FK		INT	NOT NULL	department.dept_id	
course_name			VARCHAR(50)	UNIQUE; NOT NULL		
course_description			TEXT	NOT NULL		Goes over aspects of the course
course_cost			DECIMAL(7, 2)	NOT NULL; CHECK >= 0		Cost of the entire course.

SUBJECT						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
subject_id	PK		SERIAL			
subject_name			VARCHAR(50)	UNIQUE; NOT NULL		Unique with subject_level
subject_level			SMALLINT	UNIQUE; NOT NULL; CHECK BETWEEN 4 AND 7		Unique with subject_name
subject_description			TEXT	NOT NULL		

COURSE_SUBJECT						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
course_id	PK/FK		INT	NOT NULL	subject.subject_id	
subject_id	PK/FK		INT	NOT NULL	course.course_id	

BRANCH						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
branch_id	PK		SERIAL			
branch_name			VARCHAR(30)	UNIQUE; NOT NULL		Name describing the branch i.e. “Manchester branch”
branch_addr1			VARCHAR(50)	NOT NULL		Line 1 of address
branch_addr2			VARCHAR(50)			Line 2 of address
branch_city			VARCHAR(30)	NOT NULL		
branch_postcode			VARCHAR(20)			
branch_country_code			CHAR(2)	NOT NULL		2 letter country code to indicate branch location
branch_email			VARCHAR(50)	UNIQUE; NOT NULL		The contact email for the branch.
branch_phone_country_code			VARCHAR(4)	NOT NULL; CHECK SIMILAR TO ‘\+[0-9]{1,3}’		Country code for the mobile number: +1, +44, +306, etc.
branch_phone_number			VARCHAR(15)	UNIQUE; NOT NULL		

STAFF						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
staff_id	PK		SERIAL			
dept_id	FK		INT	NOT NULL	department.dept_id	
branch_id	FK		INT	NOT NULL	branch.branch_id	
is_branch_manager			BOOLEAN	NOT NULL		States whether a member of staff is also a branch manager
staff_email			VARCHAR(50)	UNIQUE NOT NULL		The business email of the staff member.
staff_mobile_code			VARCHAR(4)	NOT NULL; CHECK SIMILAR TO '\+[0-9]{1,3}'		Country code for the mobile number: +1, +44, +306, etc.
staff_mobile_number			VARCHAR(15)	UNIQUE NOT NULL		
staff_first_name			VARCHAR(30)	NOT NULL		
staff_middle_name			VARCHAR(30)			
staff_last_name			VARCHAR(30)	NOT NULL		
staff_title			ENUM	NOT NULL		Preferred title: Mr, Mrs, Miss, etc.
staff_addr1			VARCHAR(50)	NOT NULL		Line 1 of address
staff_addr2			VARCHAR(50)			Line 2 of address

staff_city			VARCHAR(30)	NOT NULL		
staff_postcode			VARCHAR(20)			
staff_country_code			CHAR(2)	NOT NULL		2 letter country code to indicate country of residence

STAFF_ASSIGNMENT						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
staff_assignment_id	PK		SERIAL			
branch_manager_id	FK		INT	NOT NULL	staff.staff_id	The manager who assigns the task.
staff_id	FK		INT	NOT NULL	staff.staff_id	
assignment_title			VARCHAR(100)	NOT NULL		Summary of task(s)
assignment_description			TEXT	NOT NULL		Detailed description of task(s)
assignment_deadline			TIMESTAMP			When the task(s) should be completed by
assignment_complete			BOOLEAN	NOT NULL		
is_urgent			BOOLEAN	NOT NULL		Whether the task should be marked as urgent/to do asap.

COURSE_STAFF						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
staff_id	PK/FK		INT	NOT NULL	staff.staff_id	
course_id	PK/FK		INT	NOT NULL	course.course_id	

ROLE						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
role_id	PK		SERIAL			
role_name			VARCHAR(50)	UNIQUE; NOT NULL		The role a staff member performs
role_description			TEXT	NOT NULL		Duties of the role

STAFF_ROLE						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
staff_id	PK/FK		INT	NOT NULL	staff.staff_id	
role_id	PK/FK		INT	NOT NULL	role.role_id	

STAFF_AVAILABILITY						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
staff_id	PK/FK		INT	NOT NULL	staff.staff_id	
day_of_week	PK		SMALLINT	NOT NULL; CHECK BETWEEN 1 AND 7		Day of the week where Monday = 1, and Sunday = 7

STAFF_ABSENCE						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
staff_id	PK		INT	NOT NULL	staff.staff_id	
absence_start	PK		TIMESTAMP	NOT NULL		What day/time the absence begins.
absence_end	PK		TIMESTAMP	NOT NULL		…ends.
absence_type			ENUM	NOT NULL		The type of absence: holiday, sickness, personal, etc.

ROOM						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
room_id	PK		SERIAL			
branch_id	FK		INT	NOT NULL	branch.branch_id	
room_name			VARCHAR(20)	NOT NULL		
room_type			ENUM	NOT NULL		Type of room e.g. classroom, lecture hall, science lab, etc.
capacity			SMALLINT	NOT NULL; CHECK > 0		Seating capacity for the room

FACILITY						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
facility_id	PK		SERIAL			
facility_name			VARCHAR(50)	UNIQUE; NOT NULL		Name of facility such as computer, microscope, printer, etc.

ROOM_FACILITY						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
room_id	PK/FK		INT	NOT NULL	room.room_id	
facility_id	PK/FK		INT	NOT NULL	facility.facility_id	
quantity			SMALLINT	NOT NULL; CHECK > 0		Amount of the facility in the room

STUDENT						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
student_id	PK		SERIAL			
student_email			VARCHAR(50)	UNIQUE; NOT NULL		
student_first_name			VARCHAR(30)	NOT NULL		
student_middle_name			VARCHAR(30)			
student_last_name			VARCHAR(30)	NOT NULL		
student_title			ENUM	NOT NULL		Title: Mr, Mrs, Miss, etc.
student_mobile_code			CHAR(4)	NOT NULL; CHECK SIMILAR TO '\+[0-9]{1,3}'		Country code for the mobile number: +1, +44, +306, etc.
student_mobile			VARCHAR(15)	UNIQUE; NOT NULL		
student_addr1			VARCHAR(50)	NOT NULL		Line 1
student_addr2			VARCHAR(50)			Line 2
student_city			VARCHAR(30)	NOT NULL		
student_postcode			VARCHAR(20)			
student_country_code			VARCHAR(2)	NOT NULL		2 letter country code of residence
student_date_of_birth			DATE	NOT NULL		

EMERGENCY_CONTACT						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
student_emergency_contact_id	PK		SERIAL			
student_id	FK		INT	NOT NULL	student.student_id	
student_emergency_contact_first_name			VARCHAR(30)	NOT NULL		
student_emergency_contact_last_name			VARCHAR(30)	NOT NULL		
student_emergency_contact_relationship			VARCHAR(20)	NOT NULL		Relationship to the student
student_emergency_phone_country_code			VARCHAR(4)	NOT NULL; CHECK SIMILAR TO '\+[0-9]{1,3}'		Country code for the mobile number: +1, +44, +306, etc.
student_emergency_contact_number			VARCHAR(15)	UNIQUE; NOT NULL		Main phone number of contact
student_emergency_contact_alt_number			VARCHAR(15)			Alternative phone number (assumes same country code)
student_emergency_contact_email			VARCHAR(50)	UNIQUE; NOT NULL		
student_emergency_other_details			TEXT			Other details the student would log about the emergency contact
emergency_shares_student_address			BOOLEAN	NOT NULL		If they live in the same address as the student

HEALTH_CONDITION						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
health_condition_id	PK		SERIAL			
health_condition_name			VARCHAR(30)	UNIQUE; NOT NULL		The name of the physical/mental health condition that could impact learning/facilitate extra accommodation for the student.
health_condition_notes			TEXT			Details about the condition that staff should know.

STUDENT_HEALTH_CONDITION						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
student_id	PK/FK		INT	NOT NULL	student.student_id	
health_condition_id	PK/FK		INT	NOT NULL	health_condition.health_condition_id	
severity			SMALLINT	NOT NULL; CHECK BETWEEN 1 AND 5		How severe the condition is, 1 = not severe, 3 = mild, 5 = very severe
student_health_notes			TEXT			Details of the specific student’s condition that staff should know.

EVALUATION_SESSION						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
tutor_id	PK/FK		INT	NOT NULL	staff.staff_id	
student_id	PK/FK		INT	NOT NULL	student.student_id	
session_datetime	PK		TIMESTAMP	NOT NULL		
room_id	FK		INT	CHECK (IS NOT NULL AND is_online = FALSE) OR (IS NULL AND is_online = TRUE)	room.room_id	The room the session is held in, if it is not online, hence why it can be NULL.
session_notes			TEXT			Notes about the student's performance.
is_online			BOOLEAN	NOT NULL;		Whether the session takes place online or not.

ASSIGNMENT						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
assignment_id	PK		SERIAL			
staff_id	FK		INT	NOT NULL	staff.staff_id	
subject_id	FK		INT	NOT NULL	subject.subject_id	
set_date			TIMESTAMP	NOT NULL		
due_date			TIMESTAMP	CHECK (>= set_date) OR (IS NULL)		When the assignment is due (if at all)
assignment_description			TEXT			Details of what to do for the assignment.
is_assignment_assessed			BOOLEAN	NOT NULL		Whether the assessment counts towards the final course grade.
assignment_weight			DECIMAL(5, 2)	CHECK (BETWEEN 0 AND 100) OR (IS NULL)		How much this assessment contributes towards the final grade, as a percentage.

STUDENT_ASSIGNMENT						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
student_id	PK/FK		INT	NOT NULL	student.student_id	
assignment_id	PK/FK		INT	NOT NULL	assignment.assignment_id	
submission_datetime	PK		TIMESTAMP	NOT NULL		
assignment_percentage			DECIMAL(5, 2)	CHECK (BETWEEN 0 AND 100) OR (IS NULL)		What the percentage of this submission is.

SESSION						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
session_id	PK		SERIAL			
subject_id	FK		INT	NOT NULL	subject.subject_id	
room_id	FK		INT	CHECK (IS NOT NULL AND is_online = FALSE) OR (IS NULL AND is_online = TRUE)	room.room_id	The room the session takes place in, if it is not online, hence why it can be NULL.
session_type			ENUM	NOT NULL		Session type e.g. 1-to-1, lecture, practical.
session_status			VARCHAR(15)	NOT NULL		
session_name			VARCHAR(100)	NOT NULL		
session_start			TIMESTAMP	NOT NULL		
session_end			TIMESTAMP	NOT NULL; CHECK >= session_start		
is_online			BOOLEAN	NOT NULL		Whether the session takes place online or not.

SESSION_STUDENT						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
session_id	PK/FK		INT	NOT NULL	session.session_id	
student_id	PK/FK		INT	NOT NULL	student.student_id	
attendance_status			VARCHAR(15)	NOT NULL		
feedback_general_rating			SMALLINT	CHECK BETWEEN 0 AND 10		Feedback rating for session overall. 0 = horrible, 10 = excellent
feedback_online_connection_quality			SMALLINT	CHECK BETWEEN 0 AND 10		Feedback rating for online connection quality. 0 = horrible, 10 = excellent
feedback_concept_understood_rating			SMALLINT	CHECK BETWEEN 0 AND 10		Feedback rating for understanding of what was taught. 0 = horrible, 10 = excellent
feedback_extra_notes			TEXT			Extra feedback notes if applicable.

SESSION_STAFF						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
session_id	PK/FK		INT	NOT NULL	session.session_id	
staff_id	PK/FK		INT	NOT NULL	staff.staff_id	

ENROLMENT						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
enrolment_id	PK		SERIAL			
course_id	FK		INT	NOT NULL	course.course_id	
student_id	FK		INT	NOT NULL	student.student_id	
enrolment_status			VARCHAR(15)	NOT NULL		Status of enrolment, completed, in progress, etc.
enrolment_start_date			DATE	NOT NULL		The date the student started the course
enrolment_end_date			DATE	NOT NULL	CHECK > enrolment_end_date	The predicted/actual end date of the course
final_grade_percentage			DECIMAL(5, 2)		CHECK (BETWEEN 0 AND 100) OR (IS NULL)	Final mark as a percentage for completing the course (if applicable)

STUDENT_PAYMENT						
Attribute Name	**KEY**	**INDEX**	**Data Type & Size**	**Domains & Constraints**	**FK Reference**	**Description**
payment_id	PK		SERIAL			
enrolment_id	FK		INT	NOT NULL	enrolment.enrolment_id	
payment_status			VARCHAR(15)	NOT NULL		Status of payment, i.e. Expected, Processing, Failed, Completed
payment_amount			DECIMAL(7, 2)	NOT NULL; CHECK >= 0		
payment_datetime			TIMESTAMP	NOT NULL		Date and time of payment

References

Blackorby J. & Cameto R. (2004) Changes in the School Engagement and Academic Performance of Students with Disabilities. In: Blackorby, J., Wagner, M., Levine, P., Newman, L., Marder, C., Cameto, R., Huang, T., & Sanford, C. (2004). Wave 1 Wave 2 Overview (pp. 123-146).